

What is claimed is:

1. A method for manufacturing a thin film transistor in which a semiconductor layer, a gate insulating film and a gate electrode are laminated over a transparent substrate in this order comprising the steps of:

a step of forming a semiconductor layer over said transparent substrate;

a step of forming a gate insulating film in contact with said semiconductor layer;

a step of forming a conductive film over said gate insulating film;

a step of patterning said conductive film thereby forming a pattern comprising said conductive film;

a step of adding an impurity which will be donor or acceptor into said semiconductor layer by using said pattern comprising said conductive film as a mask;

a step of applying a photoresist covering said pattern comprising said conductive film;

a step of exposing said photoresist to a light irradiated from back of said transparent substrate and developing thereby forming a photoresist pattern that is narrower than said pattern comprising said conductive film;  
and

a step of forming a gate electrode by patterning said pattern comprising said conductive film by using said photoresist pattern as a mask.

2. A method according to claim 1 further comprising a step of adding an impurity which will be donor or acceptor into said semiconductor layer by using said gate electrode as a mask, after said step of forming a gate electrode.

3. A method for forming a thin film transistor in which a semiconductor layer, a gate insulating film and a gate electrode are laminated over a transparent substrate in this order comprising the steps of:

a step of forming a semiconductor layer over said transparent substrate;

a step of forming a gate insulating film in contact with said semiconductor layer;

a step of forming a conductive film over said gate insulating film;

a step of patterning said conductive film thereby forming a pattern comprising said conductive film;

a step of adding an impurity which will be donor or acceptor into said semiconductor layer by using said pattern comprising said conductive film as a mask;

a step of applying a photoresist covering said pattern

comprising said conductive film;

a step of exposing said photoresist to a light irradiated from back of said transparent substrate and developing thereby forming a photoresist pattern that is narrower than said pattern comprising said conductive film;

a step of forming a gate electrode by patterning said pattern comprising said conductive film by using said photoresist pattern as a mask;

a step of patterning said gate insulating film by using said gate electrode as a mask; and

a step of adding an impurity which will be donor or acceptor into said semiconductor layer by using said gate electrode as a mask.

4. An active matrix substrate using a thin film transistor manufactured according to claim 1, 2 or 3 as an switching element of a pixel matrix circuit.

5. A liquid crystal display using the active matrix substrate of claim 4.

6. An electronic device using the liquid crystal display according to claim 5 as a display portion.

7. A method for manufacturing an active matrix substrate having a thin film transistor in which a semiconductor layer, a gate insulating film and a gate electrode are laminated over

a transparent substrate in this order comprising the steps of:

a step of forming a semiconductor layer over said transparent substrate;

a step of forming a gate insulating film in contact with said semiconductor layer;

a step of forming a conductive film over said gate insulating film;

a step of patterning said conductive film thereby forming a pattern comprising said conductive film;

a step of adding an impurity which will be donor or acceptor into said semiconductor layer by using said pattern comprising said conductive film as a mask;

a step of applying a photoresist covering said pattern comprising said conductive film;

a step of exposing said photoresist to a light irradiated from back of said transparent substrate and developing thereby forming a photoresist pattern that is narrower than said pattern comprising said conductive film; and

a step of forming a gate electrode by patterning said pattern comprising said conductive film by using said photoresist pattern as a mask.

8. A method according to claim 7 further comprising a step

of adding an impurity which will be donor or acceptor into said semiconductor layer by using said gate electrode as a mask, after said step of forming a gate electrode.

9. A method for manufacturing an active matrix substrate having a thin film transistor in which a semiconductor layer, a gate insulating film and a gate electrode are laminated over a transparent substrate in this order comprising the steps of:

a step of forming a semiconductor layer over said transparent substrate;

a step of forming a gate insulating film in contact with said semiconductor layer;

a step of forming a conductive film over said gate insulating film;

a step of patterning said conductive film thereby forming a pattern comprising said conductive film;

a step of applying a photoresist covering said pattern comprising said conductive film;

a step of exposing said photoresist to a light irradiated from back of said transparent substrate and developing thereby forming a photoresist pattern that is narrower than said pattern comprising said conductive film;

a step of adding an impurity which will be donor or acceptor into said semiconductor layer by using said

photoresist pattern as a mask;

a step of forming a gate electrode by patterning said pattern by using said photoresist pattern as a mask;

a step of patterning said gate insulating film by using said gate electrode as a mask; and

a step of adding an impurity which will be donor or acceptor into said semiconductor layer by using said gate electrode as a mask.

10. A method according to 1 or 3, wherein said thin film transistor is used in a semiconductor device selected from a group consisting of a computer, a projector, a projecting TV, a head mounted display, a video camera, a digital still camera, a car navigation system, a notebook type personal computer, a mobile telephone or an electronic notebook.

11. A method according to 7 or 9, wherein said thin film transistor is used in a semiconductor device selected from a group consisting of a computer, a projector, a projecting TV, a head mounted display, a video camera, a digital still camera, a car navigation system, a notebook type personal computer, a mobile telephone or an electronic notebook.